



NEWS! From the NAVAL OBSERVATORY

U.S. NAVAL OBSERVATORY

3450 MASSACHUSETTS AVE., NW

WASHINGTON, DC 20392-5420

U.S. Naval Observatory Press Release

Geoff Chester
USNO Public Affairs Office
(202) 762-1438
grc@usno.navy.mil

Information Contact:
Dr. Norbert Zacharias
U.S. Naval Observatory, Washington, DC
(202) 762-1423
nz@usno.navy.mil

For release at 9:20 am, PST, January 11, 2005

USNO Releases Most Comprehensive Star Catalog ... Ever!

The U.S. Naval Observatory (USNO) announces the release of the first version of the Naval Observatory Merged Astrometric Dataset (NOMAD), the first star catalog to record most of the available astrometric and photometric data for all stars in the sky from the brightest "naked-eye" stars to a brightness limit of 21st magnitude. This means that the faintest objects in the catalog are over one million times fainter than the faintest star detectable with the naked eye at a dark-sky site.

The almost 100 gigabyte dataset contains positional and visual photometric data for about 1.1 billion stars derived from the Hipparcos, Tycho-2, UCAC2, YB6, and USNO-B1.0 catalogs. Brightness data from the 2-Micron All Sky Survey (2MASS) near-infrared catalog has been added by cross-correlating it with the optical data to produce an even more useful tool for the general astronomical community. By comparison, the Hipparcos catalog produced by the European Space Agency (ESA) in 1997 contains "only" about 118,000 stars to a faint limit of what typically can be seen in binoculars under a dark sky.

Positions of stars are measured on an imaginary grid projected as a sphere onto the sky. A sphere has a circumference of 360 degrees, each degree consists of 60 arcminutes, and each arcminute is divided into 60 arcseconds. A milliarcsecond (mas, 1/1000th of an arcsecond) is the apparent size a US quarter-dollar coin would appear to have if seen from a distance of about 2500 miles (4000 km).

ESA's Hipparcos Catalog yields positions for its 118,000 stars with errors in the 15 mas range for 2005, derived from observations made by the ESA HIPPARCOS satellite. The Tycho-2 catalog was constructed from a combination of HIPPARCOS and ground-based data, containing the 2.5 million brightest stars in the entire sky with positional errors in the 15 to 100 mas range. USNO led the effort to provide accurate proper motions of these stars for the Tycho-2 catalog.

In May 2004, USNO completed the observational program of the USNO CCD Astrograph Catalog (UCAC), a new all-sky astrometric survey performed with a relatively small but specialized wide-field telescope equipped with a large CCD detector. Stars from the preliminary UCAC2 reductions (about 86% of the total observed) have been used in the current NOMAD catalog construction. These roughly 50 million stars are generally fainter than the faintest Hipparcos stars and go as faint as 16th magnitude, about the limit of what can be seen in a large amateur telescope. Positional errors of the UCAC data are on the 20 to 70 mas level, depending on brightness.

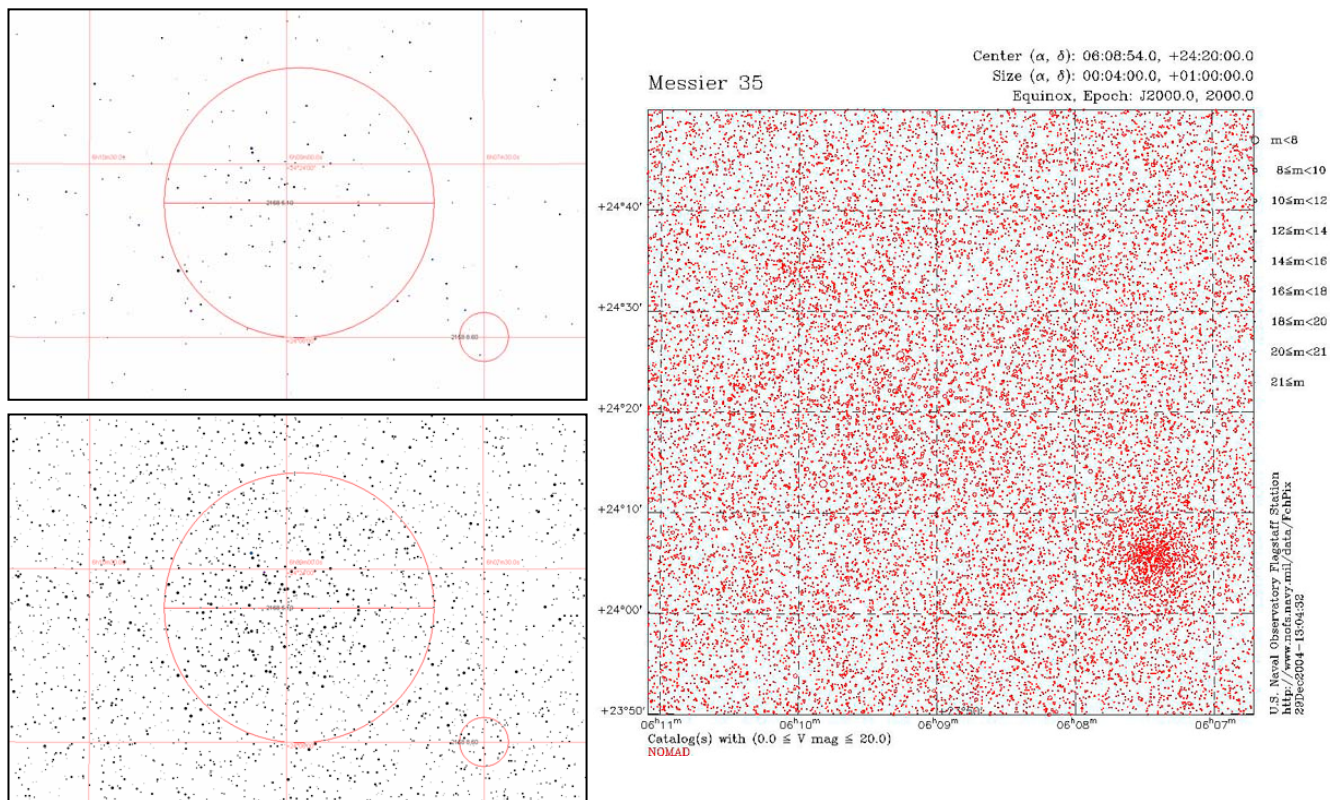
YB6 is the "Yellow-Blue" catalog version 6. These are unpublished data obtained from complete scans of the Northern and Southern Proper Motion (NPM, SPM) surveys. These photographic plates were taken in the visual ("yellow") and blue spectral bandpasses, and show stars to 18th magnitude. The catalog with the most stars by far which is incorporated into the NOMAD project is the USNO-

B1.0 catalog of about 1 billion stars obtained from scans of thousands of large-scale sky survey plates taken over many decades. All these plates were processed with the Precise Measuring Machine (PMM), a large, fast, highly precise plate measuring engine located at the Naval Observatory Flagstaff Station (NOFS) in Arizona. Positional errors of these catalogs are on the 200 mas level.

Many of these individual source catalogs “overlap”, so many stars may be recorded in more than one catalog. For the general user it is often confusing to identify the "best" catalog for the purpose at hand or a complex task to cross-reference the individual catalogs to derive the "correct" answer. The goal of NOMAD is to provide a unique position entry for each star in the set of data. For each star a sequence of selection priorities is followed, and NOMAD contains flags to identify the source catalogs and gives cross-reference identifications to these sources. The end product gives the customer the convenience of "one-stop shopping" to get the best available positional data of any star covered, regardless of its brightness or location in the sky. NOMAD also contains proper motion information for most of its entries, and the added photometric (optical and near-infrared brightness) data allows the user to query the dataset in ways which would be impossible from the individual catalogs alone.

This first release of NOMAD is not a compiled catalog. If a star is identified in more than one of the source catalogs only one source entry is chosen, instead of providing a "mean" position from the multiple source catalogs. Local and global systematic errors of the various source catalogs will therefore be present in this version of the database. Astrometric data from all of the source catalogs have been referenced to the International Celestial Reference System to the limitations of the source catalogs themselves. As always, it is recommended to read the introduction to NOMAD and the original catalogs comprising the dataset.

For more information and data retrieval see our homepage at www.nofs.navy.mil/nomad.html. NOMAD is a joint effort by many people at the USNO at both their Washington, DC and Flagstaff, AZ locations.



Representative one-degree star fields centered on the galactic star cluster Messier 35.

*Above left: Field comprised of data from the **Tycho-2** Catalog.*

*Below Left: Field comprised of data from the **UCAC2** Catalog.*

*Right: Field as represented by **NOMAD**. The concentration at lower right is the faint galactic cluster NGC 2158.*

Higher resolution images may be found at <http://www.usno.navy.mil/pao/press/NOMAD/>